EE318061516US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Docket No. **AT9-99-697**

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:
Transmitted herewith for filing is the patent application of Inventor(s):

Hatim Yousef Amro
John Paul Dodson

For: **INTEROPERABLE/HETEROGENEOUS ENVIRONMENT KEYBOARD**

Enclosed are also:

X 15 Pages of Specification including an Abstract
X 4 Pages of Claims
X 5 Sheet(s) of Drawings
X A Declaration and Power of Attorney
X Form PTO 1595 and assignment of the invention to IBM Corporation

CLAIMS AS FILED

FOR	Number Filed		Number Extra		Rate		Basic Fee ($760)
Total Claims	15	-20 =	0	X	$ 18	=	$0
Independent Claims	3	-3 =	0	X	$ 78	=	$0
Multiple Dependent Claims	0			X	$260	=	$0
					Total Filing Fee	=	$760.00

X Please charge $760.00 to IBM Corporation, Deposit Account No. 09-0447.
X The Commissioner is hereby authorized to charge payment of the following fees associated with the communication or credit any over payment to IBM Corporation, Deposit Account No. 09-0447. A duplicate copy of this sheet is enclosed.
  X Any additional filing fees required under 37CFR § 1.16.
  X Any patent application processing fees under 37CFR § 1.17.

Respectfully,

Leslie A. Van Leeuwen

Leslie A. Van Leeuwen
Reg. No. 42,196
Intellectual Property Law Dept.
IBM Corporation
11400 Burnet Road 4054
Austin, Texas 75758
Telephone: (512) 823-6746

EE318061560US

Docket No. AT9-99-697

INTEROPERABLE/HETEROGENEOUS ENVIRONMENT KEYBOARD

BACKGROUND OF THE INVENTION

1. Technical Field:

The present invention relates generally to data processing systems and, more specifically, to methods of efficiently utilizing space allocated to storing data processing systems and associated peripheral devices.

2. Description of Related Art:

Computers perform many functions in today's society, often performing tasks and monitoring processes with minimal or no human intervention. Many businesses and service providers may have rooms or laboratories filled with numerous computers, all running various applications or monitoring various activities for the business or service provider. Often, to provide the applications or monitoring needed or desired by the business or service provider, very large numbers of computers are required to perform all the various tasks.

The rooms in which these computers are located are often very crowded. In addition to each individual computer or system unit, each computer also includes a monitor, a keyboard and mouse. Indeed, it is a common problem that there are often more computers than available space in which to store them.

One of the inefficiencies with storing a large number of computers within a finite amount of space is the keyboard redundancy. For every "n" number of

computers that are stored, there are typically "n" number of keyboards also stored. However, keyboards are rather large and bulky and take up a rather large amount of space, especially when large numbers of computers are involved, as is typically true in most computer labs. As mentioned above, however, many or most of the computers within the room may be performing functions in which little or no direct human interaction is involved. Often times, the vast majority of computers within the room need a keyboard or other peripheral input device to interact with a computer so infrequently that it does not make sense to store one keyboard for every computer in the room. Therefore, many if not most of the keyboards within the computer lab or room are redundant.

Thus, a system for reducing the number of keyboards required to service a lab full of computers is desirable. It would be even more desirable, if, for some large number of computers, only a few keyboards were needed to service all of the computers within the lab. Thus, a keyboard that can be used with more than one computer is desirable. This arrangement would free up a large amount of space, thereby increasing the capacity of computers that could be stored in the same amount of space.

SUMMARY OF THE INVENTION

The present invention minimizes the number of keyboards required to service a large number of computers. In a preferred embodiment, the system includes a peripheral input device, such as a keyboard or mouse, and a plurality of data processing systems. Each of the data processing systems has a wireless receiver for receiving wireless communications from the peripheral input device. The peripheral input device includes a computer selector for selecting one of the plurality of data processing systems to which the peripheral input device will interact. The peripheral input device also includes a wireless transmitter for providing communications with any one of the plurality of data processing systems.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself, however, as well as a preferred mode of use, further objectives and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

Figure 1 depicts a block diagram of a data processing system in which the present invention may be implemented;

Figure 2 depicts a block diagram of an infrared wireless keyboard in which the processes of the present invention may be implemented;

Figure 3 depicts a pictorial diagram illustrating a room of computers serviced by a single keyboard in accordance with a preferred embodiment of the present invention;

Figure 4 depicts a flowchart illustrating a method of determining whether a keyboard has been assigned to a data processing system in accordance with a preferred embodiment of the present invention; and

Figure 5 depicts a flowchart illustrating a method in a keyboard for assigning the keyboard to a particular data processing system in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference now to the figures, and in particular with reference to **Figure 1**, a pictorial diagram illustrating a room **100** of computers serviced by a single keyboard is depicted in accordance with a preferred embodiment of the present invention. Room **100** comprises four data processing systems **104**, **106**, **108**, and **110** and a keyboard **102**. Data processing systems **104**, **106**, **108**,and **110** may be implemented, for example, as data processing system **300** described below. Keyboard **102** may be implemented, for example, as infra-red wireless keyboard **200** described below. Keyboard **102** is interoperable with multiple types of data processing systems having different hardware configurations and running different operating systems, thus functioning in a heterogeneous environment.

Referring now to **Figure 2**, a block diagram of an infrared wireless keyboard **200** in which the processes of the present invention may be implemented is illustrated. Infrared wireless keyboard **200** comprises a microprocessor **201**, key matrix **202**, computer select button **203**, infrared driver **204**, power source control circuit **205**, and battery **206**. Computer select button **203** allows a user to select a specific data processing system from a plurality of data processing systems to which keyboard **200** will be assigned by aiming the infrared emitter at the selected data processing system and pushing computer select button **203**.

Keyboard **200** may also include a keyboard select

on/off switch (not shown). Such an on/off switch would allow a user to activate and deactivate computer select button **203** such that after assigning the keyboard to a computer, computer select button **203** may be deactivated such that the user can not inadvertently deassign or reassign the keyboard during operation. Once the user decided to deassign or reassign the keyboard to a different computer, the on/off switch is placed in the on position allowing activation of computer select button **203**.

In operation, microprocessor **201** sends scanning signals to key matrix **202** in order to detect the depression of one of the keys. If no keys are depressed, power source control circuit **205** places microprocessor **201** into a low-power standby mode. Control circuit **205** also resets microprocessor **201** if power is cut off, ensuring proper microprocessor operation in all cases. If a key has been depressed, control circuit **205** switches microprocessor **201** to a normal operating mode. Microprocessor **201** assigns a key code to the depressed key according to its position in the key matrix. A data word is then created by microprocessor **201** from the key code. Software within microprocessor **201** then generates a carrier frequency and transmits the data word according to a known communications format such as RS 232, at the carrier frequency. Infra-red driver **204** emits the data through an infra-red LED.

Referring now to **Figure 3**, a block diagram of a data processing system in which the present invention may be implemented is illustrated.

Data processing system **300** is an example of a client computer. Data processing system **300** employs a peripheral component interconnect (PCI) local bus architecture. Although the depicted example employs a PCI bus, other bus architectures, such as Micro Channel and ISA, may be used. Processor **302** and main memory **304** are connected to PCI local bus **306** through PCI bridge **308**. PCI bridge **308** may also include an integrated memory controller and cache memory for processor **302**. Additional connections to PCI local bus **306** may be made through direct component interconnection or through add-in boards. In the depicted example, local area network (LAN) adapter **310**, SCSI host bus adapter **312**, and expansion bus interface **314** are connected to PCI local bus **306** by direct component connection. In contrast, audio adapter **316**, graphics adapter **318**, and audio/video adapter (A/V) **319** are connected to PCI local bus **306** by add-in boards inserted into expansion slots. Expansion bus interface **314** provides a connection for a keyboard and mouse adapter **320**, modem **322**, and additional memory **324**. Keyboard mouse adapter **320** also provides an interface to a infrared detector and transmitter used to provide wireless communications with a keyboard and/or mouse. In the depicted example, SCSI host bus adapter **312** provides a connection for hard disk drive **326**, tape drive **328**, CD-ROM drive **330**, and digital video disc read only memory drive (DVD-ROM) **332.** Typical PCI local bus implementations will support three or four PCI expansion slots or add-in connectors.

An operating system runs on processor **302** and is

used to coordinate and provide control of various components within data processing system **300** in **Figure 3**. The operating system may be a commercially available operating system, such as OS/2, which is available from International Business Machines Corporation. "OS/2" is a trademark of International Business Machines Corporation. An object oriented programming system, such as Java, may run in conjunction with the operating system, providing calls to the operating system from Java programs or applications executing on data processing system **300**. Instructions for the operating system, the object-oriented operating system, and applications or programs are located on a storage device, such as hard disk drive **326**, and may be loaded into main memory **304** for execution by processor **302.**

Those of ordinary skill in the art will appreciate that the hardware in **Figure 3** may vary depending on the implementation. For example, other peripheral devices, such as optical disk drives and the like, may be used in addition to or in place of the hardware depicted in **Figure 3**. The depicted example is not meant to imply architectural limitations with respect to the present invention. For example, the processes of the present invention may be applied to multiprocessor data processing systems.

Referring again to **Figure 1**, each of data processing systems **104**, **106**, **108**, and **110** includes an infra-red receiver **120**, **122**, **124**, and **126** respectively. Each of data processing systems **104**, **106**, **108**, and **110** may comprise different hardware and run a different operating system. For example, data processing systems **104** and **110**

may be Intel processor based personal computers running Microsoft Windows 98 operating systems, data processing system **106** may be an Apple Macintosh computer running the System 7 operating system, and data processing system **108** may be an IBM RS/6000, a product of International Business Machines Corporation in Armonk, New York, running the Advanced Interactive Executive (AIX) operating system. Keyboard **102** may select and operate any one of data processing systems **104**, **106**, **108**, and **110**.

Keyboard **102** includes an infra-red transmitter **130** such connected to an infra-red driver such as infra-red driver **204** for transmitting signals containing key stroke and other information to a data processing system, such as one of data processing systems **104**, **106**, **108**, and **110**, having an infra-red receiver. Keyboard **102** also includes a computer select button **114**, which a user may use for selecting which of data processing systems **104**, **106**, **108**, and **110** the user wishes to operate.

When a user desires to access one of data processing systems **104**, **106**, **108**, and **110**, the user merely aims keyboard **102** at the data processing system to which the user desires access and pushes computer select button **114**. By pushing the computer select button, an infra-red signal is sent to the desired data processing system instructing that system that keyboard **102** will be communicating with it.

In the example illustrated in **Figure 1**, the user has aimed keyboard **102** at data processing system **108** and has pushed computer select button **114** to emit a signal **118**

which is detected by data processing system **108**. Signal **118** alerts data processing system **108** that keyboard **102** is now assigned to data processing system **108**. From this point on, all keystrokes are sent via infra-red (IR) to the assigned system unit **108**.

When the user wishes to reassign keyboard **102** to a different data processing system, the user merely aims keyboard **102** at a different data processing system and pushes computer select button **114** to send a signal to the new data processing system that keyboard **102** is now assigned to the new data processing system.

In an alternate embodiment, each of data processing systems **104**, **106**, **108**, and **110** is assigned a code or frequency. Every time a signal is received from keyboard **102**, each of data processing systems **104**, **106**, **108**, and **110** ignores the signal unless the signal is the code assigned to that particular data processing system indicating that it should respond to all future signals received from keyboard **102**. If such a signal is received, then the data processing system performs the tasks requested by the signals received from keyboard **102**.

When the user wishes to reassign keyboard **102** to a different data processing system, the user pushes the computer select button **114** to de-assign keyboard **102** from the selected data processing system. Receipt of a second select signal **118** by a data processing system alerts the data processing system that keyboard **102** is no loner assigned to it. Therefore, it should ignore any further communication received from keyboard **102** until it has

been reselected. The user may then assign keyboard **102** to a different data processing system. In this embodiment, computer select button **114** might be a switch that can be toggled between the different codes assigned to the data processing systems or it could comprise a pair of buttons. One of these buttons is used to scroll through a list of computer codes (which may be displayed to the user via a small display such as an LCD on keyboard **102**) by repeatedly pressing it. The other is used to select the appropriate code, once found, to send a signal to activate the appropriate data processing system.

Those of ordinary skill in the art will appreciate that the hardware in **Figure 1** may vary depending on the implementation. For example, more or fewer data processing systems may be utilized than that depicted in **Figure 1**. Furthermore, the present invention is not limited to keyboards, but applies directly to a mouse or any other peripheral device that exchanges data with a computer. The only requirement is that the peripheral device must have the capability of wireless communications with the data processing systems. Also, although described with reference to a single keyboard, there could be multiple keyboards within the computer lab. For example, a lab could contain 50 computers and five keyboards. Furthermore, more than one keyboard could be in operation at one time with, for example, one keyboard communicating with a first computer while a second keyboard is communicating simultaneously with a second computer.

Thus, the present invention allows most of a

computer lab's keyboards to be discarded, thereby saving space and clutter. The user simply reassigns the keyboard (or one of a few keyboards, if there are more than one) as needed.

In another variation of the present invention, other wireless methods of transferring data between the keyboard and the computer could be used. For example, each computer in a computer lab could be equipped with a low power radio frequency (RF) receiver for receiving communication from a peripheral device having a low power radio frequency (RF) transmitter. Each computer could be assigned to a different radio frequency and each peripheral device could have a button or other selection device for selecting the transmitting frequency. Thus, if a user wished to access a computer with a keyboard, the user would select the receiving frequency of the computer as the transmitting frequency of the peripheral device.

Referring now to **Figure 4**, a flowchart illustrating a method of determining whether a keyboard has been assigned to a data processing system is depicted in accordance with a preferred embodiment of the present invention. A data processing system idles until a signal is received from a peripheral device (step **402**). The data processing system determines whether a signal has been received (step **404**). If no signal has been received, then data processing system continues to idle (step **402**). If a signal has been received, then the data processing system determines if the received signal is a signal from a peripheral device indicating that that device has assigned itself to this data processing system

(a computer select signal) (step **406**). If the signal is not a computer select signal, then ignore the signal (step **407**) and continue to wait for signals (step **402**).

If the signal is a computer select signal, then respond to incoming signals from this device (step **408**). The data processing device receives the next signal (step **410**) and determines whether the signal is a deselect signal (step **412**). If the signal is not a deselect signal, then perform the action indicated by the signal (step **414**) and receive the next signal (step **410**). if the signal is a deselect signal, then discontinue performing actions in response to signals received from the device (step **416**). Note, the deselect signal could be identical to a select signal except for being the second select signal received from the peripheral device.

Referring now to **Figure 5**, a flowchart illustrating a method in a keyboard for assigning the keyboard to a particular data processing system is depicted in accordance with the present invention. To start, the keyboard waits for a user to select a computer to which to assign the keyboard (step **502**). The keyboard then determines whether a computer has been selected (step **504**). If a computer has not been selected, then the keyboard continues to wait for user input (step **502**). If a computer has been selected, then the keyboard must determine which computer has been selected (step **506**). The user may select a particular computer by selecting a code or frequency assigned to a particular computer or perhaps by "aiming" the keyboard at the particular computer or in any number of other manners. Once, the keyboard has determined which computer has been selected,

the keyboard sends a signal to the selected computer indicating that the keyboard has been assigned to that computer (step **508**).

It is important to note that while the present invention has been described in the context of a fully functioning data processing system, those of ordinary skill in the art will appreciate that the processes of the present invention are capable of being distributed in a form of a computer readable medium of instructions and a variety of forms and that the present invention applies equally regardless of the particular type of signal bearing media actually used to carry out the distribution. Examples of computer readable media include recordable-type media such a floppy disc, a hard disk drive, a RAM, and CD-ROMs and transmission-type media such as digital and analog communications links.

The description of the present invention has been presented for purposes of illustration and description, but is not intended to be exhaustive or limited to the invention in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art. The embodiment was chosen and described in order to best explain the principles of the invention the practical application and to enable others of ordinary skill in the art to understand the invention for various embodiments with various modifications as are suited to the particular use contemplated.

Docket No. AT9-99-697

CLAIMS:

What is claimed is:

1. A wireless computer peripheral input device for use with a data processing system, the input device comprising:

a wireless transmitter for transmitting signals; and

a selector for selecting a one of a plurality of data processing systems with which to operate, wherein invoking the selector causes a signal to be transmitted from the wireless transmitter.

2. The input device as recited in claim 1, wherein the input device is a keyboard.

3. The input device as recited in claim 1, wherein the input device is a computer mouse.

4. The input device as recited in claim 1, wherein the wireless transmitter is an infra-red transmitter.

5. The input device as recited in claim 1, wherein the wireless transmitter is a radio frequency transmitter.

6. The input device as recited in claim 5, wherein the selector allows selection of one of a plurality of radio frequencies, wherein each of the plurality of radio frequencies corresponds to a separate one of the plurality of data processing systems.

7. A computing system, comprising:

a plurality of data processing systems; and

a peripheral input device; wherein

the peripheral input device comprises a computer selector for selecting one of the plurality of data processing systems for interaction with the peripheral input device;

the peripheral input device comprises a wireless transmitter for providing communications with any of the plurality of data processing systems; and

each of the plurality of data processing systems comprises a wireless receiver for receiving wireless communications from the peripheral input device.

8. The computing system as recited in claim 7, wherein

the wireless transmitter is a radio frequency transmitter;

the wireless receiver is a radio frequency receiver;

the wireless receiver of each of the plurality of data processing systems is tuned to accept input on a received radio frequency wherein the received radio frequency for each of the plurality of data processing systems is different from that of each of the other plurality of data processing systems; and

the computer selector allows selection of one of a plurality of radio frequencies wherein each of the plurality of radio frequencies corresponds one of the received radio frequencies.

9. The computing system as recited in claim 7, wherein the wireless transmitter is an infra-red transmitter wherein selection of one of the plurality of data

processing systems is dependent upon the orientation of the peripheral input device.

10. The computing system as recited in claim 7, wherein the wireless transmitter is an infra-red transmitter wherein each one of the plurality of data processing systems ignores signals received from the peripheral input device unless a selection signal is received indicating selection of the one of the plurality of data processing systems.

11. The computing system as recited in claim 7, wherein the peripheral input device is a keyboard.

12. The computing system as recited in claim 7, wherein the peripheral input device is a computer mouse.

13. A method for accessing a plurality of data processing systems using a wireless input device, the method comprising:

receiving a selection of a particular data processing system of the plurality of data processing systems;

transmitting a signal from the wireless input device to only activate the particular data processing system within the plurality of data processing systems; and

sending data from the wireless input device to the particular data processing system after transmitting the signal to the particular data processing system.

14. The method as recited in claim 13, wherein the

signal is a code recognized by the particular data processing system.

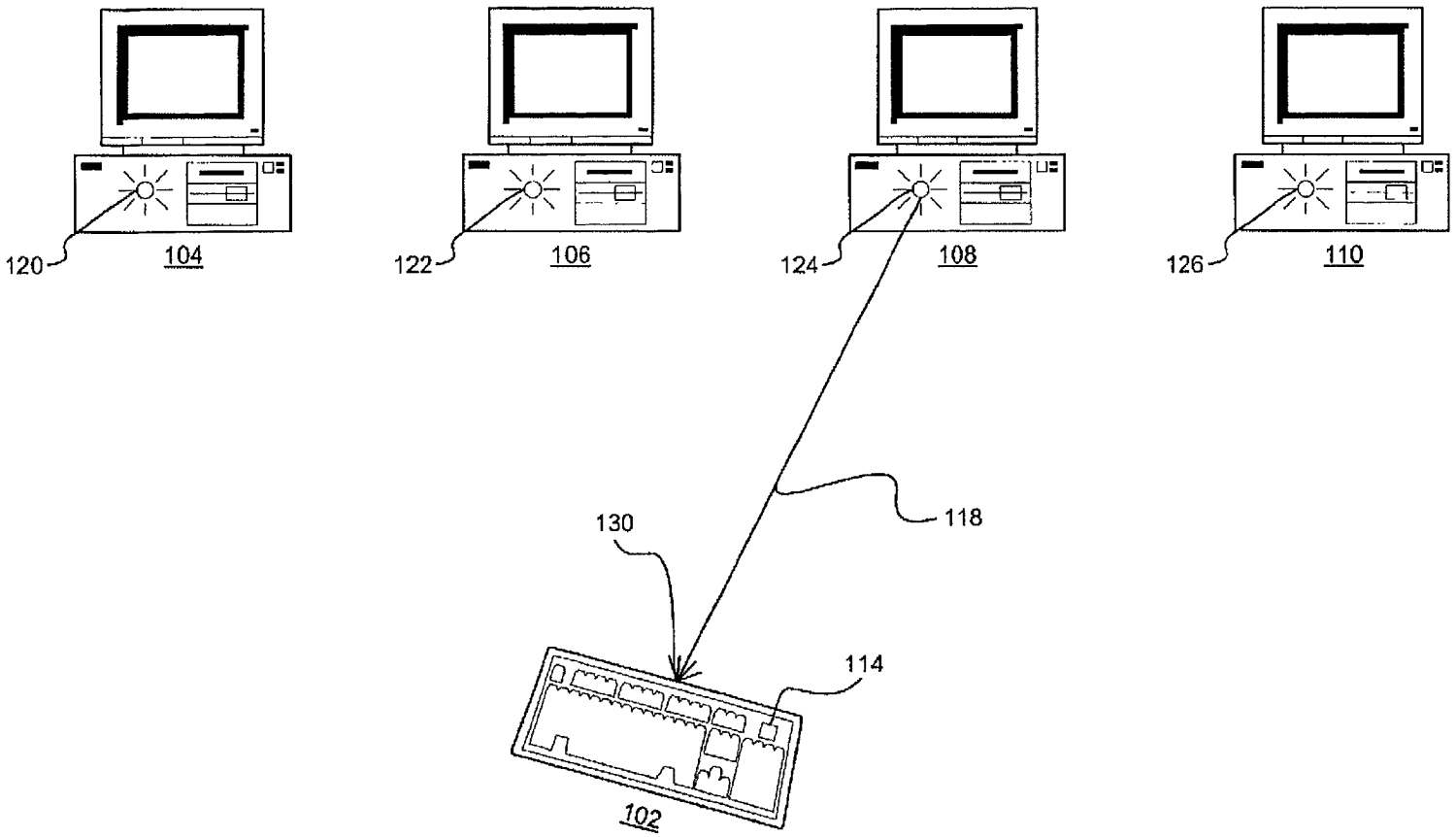
15. The method as recited in claim 13, wherein the signal is a frequency recognized by the particular data processing system.

ABSTRACT OF THE DISCLOSURE

INTEROPERABLE/HETEROGENEOUS ENVIRONMENT KEYBOARD

A computing system including a plurality of data processing systems and a peripheral input device. The peripheral input device includes a computer selector for selecting one of the plurality of data processing systems for interaction with the peripheral input device. The peripheral input device also includes a wireless transmitter for providing communications with any one of the plurality of data processing systems. Each of the plurality of data processing systems includes a wireless receiver for receiving wireless communications from the peripheral input device.

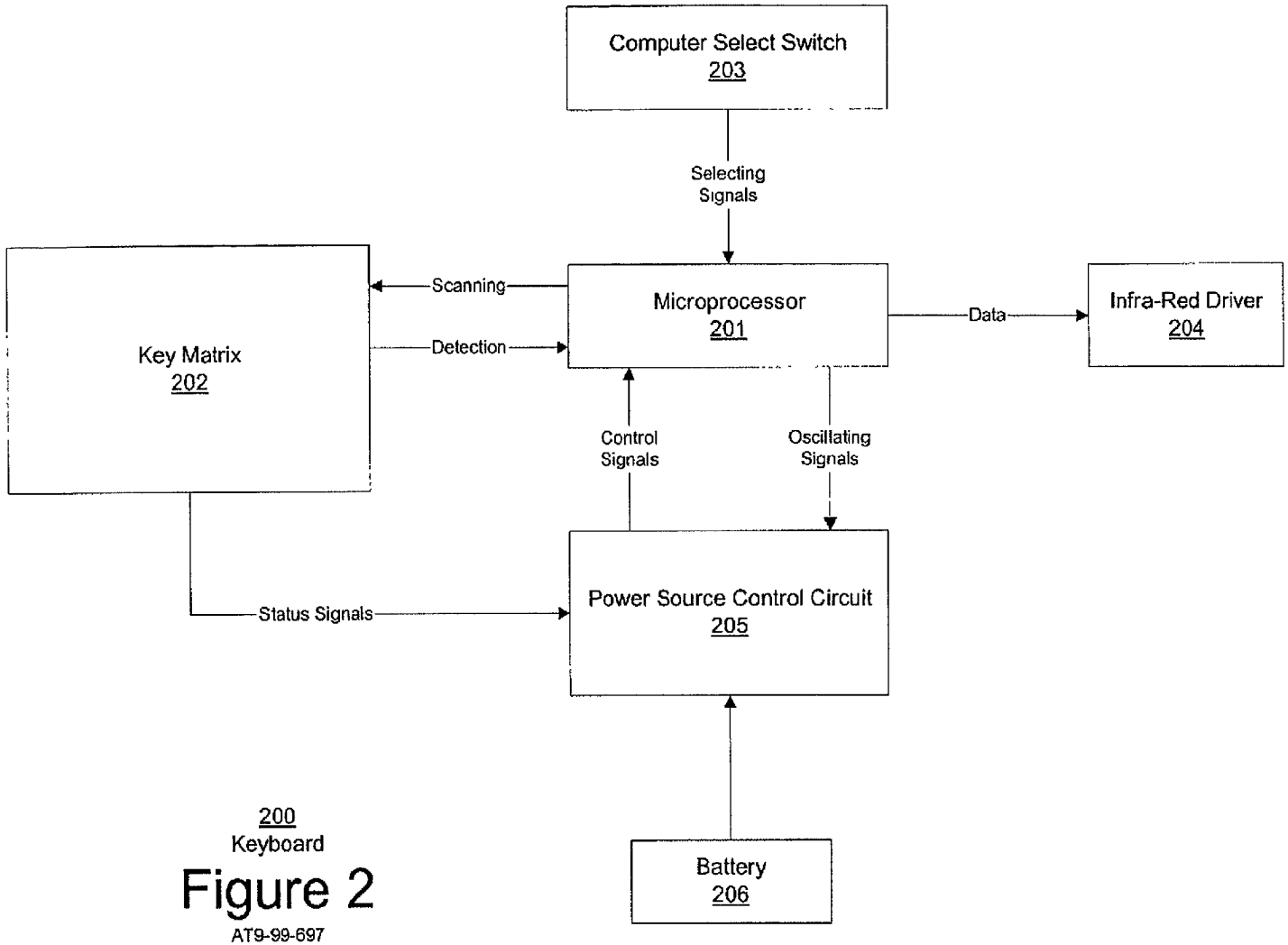
EE318061561US



100
Multiple Computer Environment with
Heterogeneous/Interoperable Keyboard

Figure 1

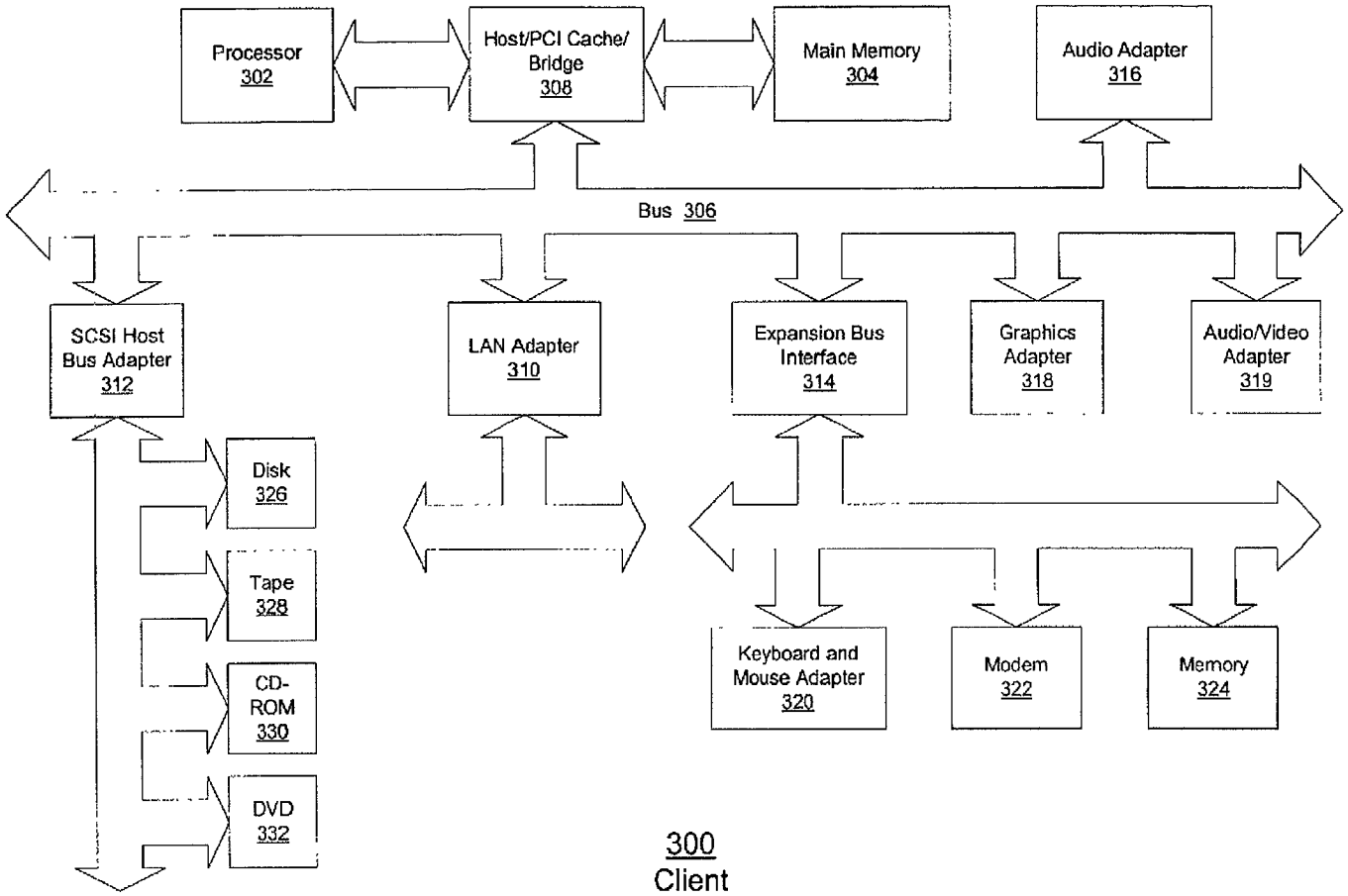
AT9-99-697



200
Keyboard

Figure 2

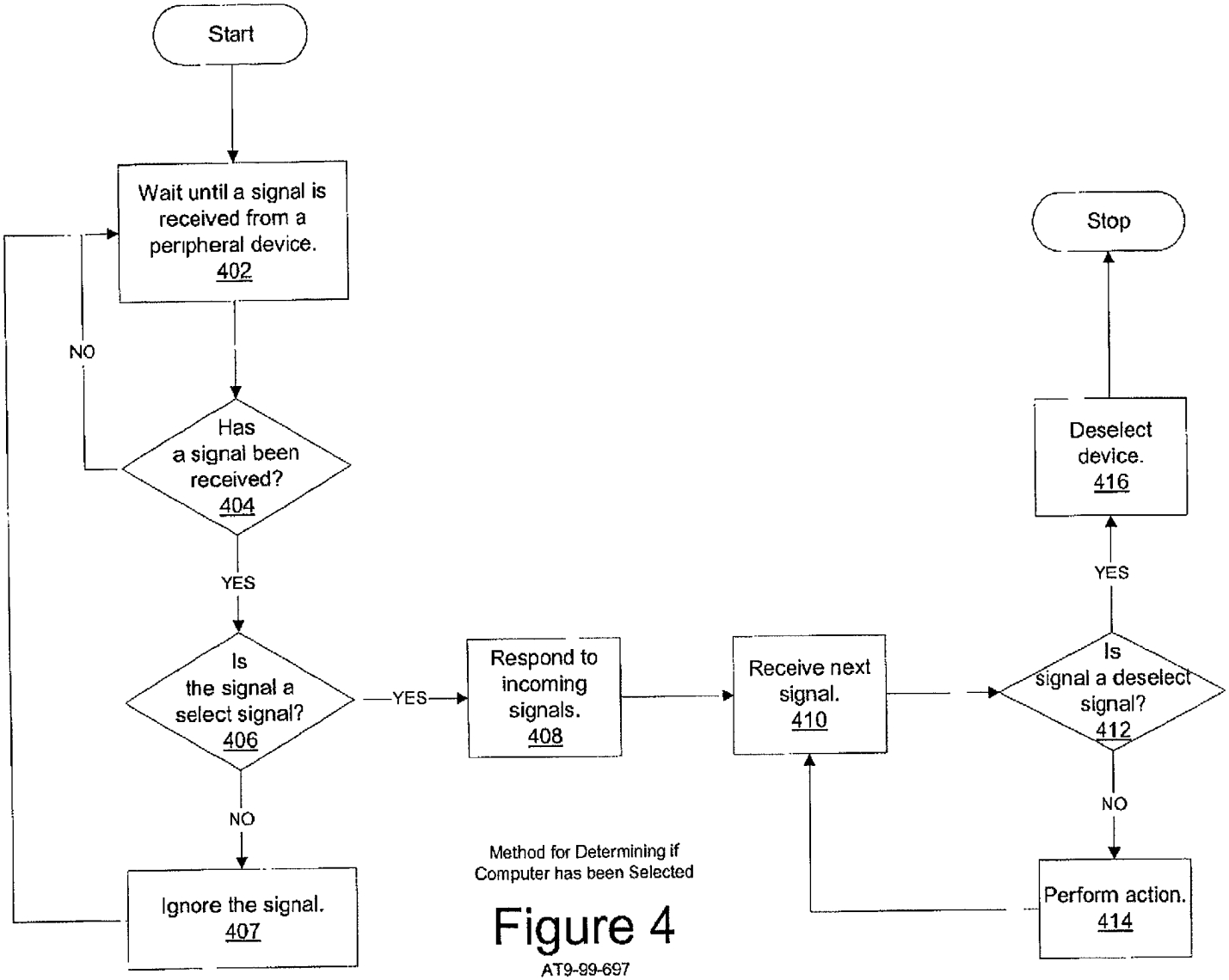
AT9-99-697



300
Client

Figure 3

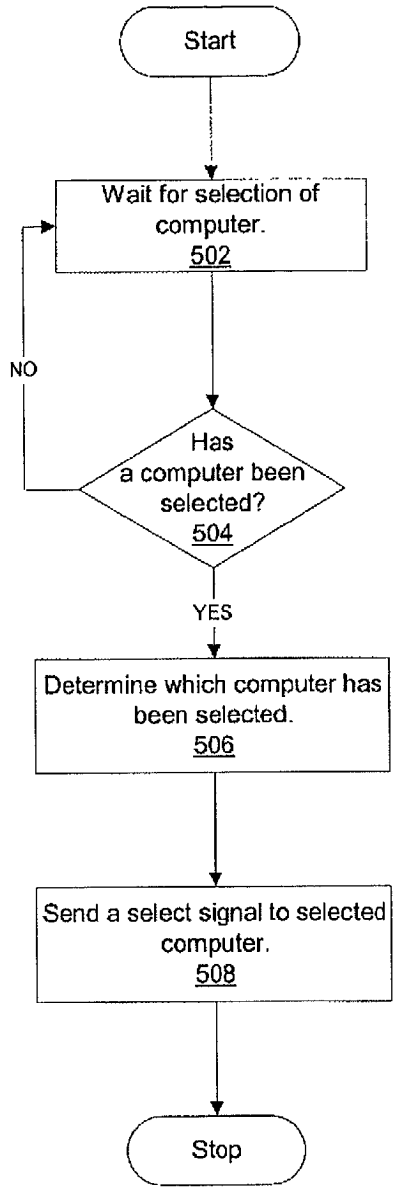
AT9-99-697



Method for Determining if Computer has been Selected

Figure 4

AT9-99-697



Computer Selection Method for Keyboard

Figure 5

AT9-99-697

DOCKET NUMBER: AT9-99-697

DECLARATION AND POWER OF ATTORNEY FOR

PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name;

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

INTEROPERABLE/HETEROGENEOUS ENVIRONMENT KEYBOARD

the specification of which (check one)

X is attached hereto.

__ was filed on _____
as Application Serial No._____
and was amended on _____
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s):			Priority Claimed
_____ (Number)	_____ (Country)	_____ (Day/Month/Year)	___ Yes___ No

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information material to the patentability of this application as defined in Title 37, Code of Federal Regulations, §1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

_____ (Application Serial #)	_____ (Filing Date)	_____ (Status)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorneys and/or agents to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

John W. Henderson, Jr., Reg. No. 26,907; Thomas E. Tyson, Reg. No. 28,543; James H. Barksdale, Jr., Reg. No. 24,091; Casimer K. Salys, Reg. No. 28,900; Robert M. Carwell, Reg. No. 28,499; Douglas H. Lefeve, Reg. No. 26,193; Jeffrey S. LaBaw, Reg. No. 31,633; David A. Mims, Jr., Reg. 32,708; Volel Emile, Reg. No. 39,969; Anthony V. England, Reg. No. 35,129; Leslie A. Van Leeuwen, Reg. No. 42,196; Christopher A. Hughes, Reg. No. 26,914; Edward A. Pennington, Reg. No. 32,588; John E. Hoel, Reg. No. 26,279; Joseph C. Redmond, Jr., Reg. No. 18,753; Marilyn S. Dawkins, Reg. No. 31,140; Mark E. McBurney, Reg. No. 33,114; Duke W. Yee, Reg. No. 34,285; Colin P. Cahoon, Reg. No. 38,836; Joseph R. Burwell, Reg. No. 44,468; Rudolph J. Buchel, Reg. No. 43,448; and Stephen R. Loe, Reg. No. 43,757.

Send correspondence to: Duke W. Yee, Carstens, Yee & Cahoon, LLP, P.O. Box 802334, Dallas, Texas 75380 and direct all telephone calls to Duke W. Yee, (972) 367-2001

FULL NAME OF SOLE OR FIRST INVENTOR: **Hatim Yousef Amro**

INVENTORS SIGNATURE: Hatim Yousef Amro DATE: 11-05-1999

RESIDENCE: 15024 Wells Port Drive
Austin, Texas 78728

CITIZENSHIP: United States

POST OFFICE ADDRESS: SAME AS ABOVE

FULL NAME OF SECOND INVENTOR: **John Paul Dodson**

INVENTORS SIGNATURE: John Paul Dodson DATE: 11-05-1999

RESIDENCE: 510 Tanner Trail
Pflugerville, Texas 78660

CITIZENSHIP: United States

POST OFFICE ADDRESS: SAME AS ABOVE